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Responses to Comments

Draft Final Revised Work Plan Technical Memorandum

Operable Unit No 7

CDH Comments on the OU7 Technical Memorandum

1 0 General Comments

1 Comment

Substantial effort is given to site-to-background statistical comparisons for the purposes of selecting Potential Contaminants of Concern (PCOCs) Due to the nature of the OU7 closure, much of this is superfluous The landfill proper will be closed using a presumptive remedy, rendering PCOC selection unnecessary Decisions regarding surface- and ground-water will be based on comparing analyte concentrations to ARARs The leachate seep is a F039 listed hazardous waste and must be managed accordingly The only OU7 areas where decisions will be risk-based, and require PCOCs/COCs for that purpose, are the sediments and soils

Response

Implementation of the presumptive remedy strategy at OU 7 does not render PCOC selection unnecessary Statistical comparisons of site-to-background data for OU 7 using the Gilbert methodology (EG&G 1994) were performed primarily for the purposes of delineating the nature and extent of contamination and evaluating remedial alternatives Where appropriate, PCOCs identified using the Gilbert methodology may be used in the risk assessment The site-to-background comparisons have been completed and will remain in the technical memorandum

2. Comment

The data sets used for two of the critical site-to-background comparisons are not appropriate The Division has previously emphasized that use of surficial soils background data from Rock Creek is limited to OUs 1 & 2 The agencies recently granted approval to DOE's *Background Soils Characterization Program Work Plan,* validated data from this effort may be available as early as this fall Additionally, the use of stream sediments as a background against which to compare the East Landfill Pond (ELP) sediments is geologically improper

If a site-to-background statistical comparison of surficial soils and sediments will drive any decisions at OU7, DOE must use approved background data However, we will not allow continued use of OU1 and OU2 data for all subsequent OUs, particularly now that a surface soil background program has been approved DOE has also failed to collect representative background for reservoir sediments This has sitewide significance and affects at least OUs 3, 5, 6, and 7

This leaves several options i) wait until suitable background data sets are available, ii) omit the statistical background comparison altogether and proceed with all analytes through the remainder of the COC selection process, or iii) assume that, based on current analyses presented in the TM showing several analytes over draft PRGs, both the East Landfill Pond surface soils and sediments will require action and include them in presumptive closure design for the landfill We recommend that DOE proceed with options ii) and iii) for the sediments and option i) for the surface soils

Response

Background data sets for surface soils and pond sediments are not drivers for landfill closure CDH has proposed waiting to perform site-to-background comparisons until a suitable background data set for surface soils is available For the purposes of presenting the nature and extent of contamination determining data gaps, and proposing additional sampling to fill them, the existing site-to-background comparisons using Rock Creek background data are sufficient Pond sediments and surface soils around the pond will be included in the presumptive closure design for the landfill Background data from the Background Soils Characterization Program will be used for site-to-background comparisons for the risk assessment on soils outside the landfill cap

3 **Comment**

Implications of subsurface contamination upgradient of the landfill and both surface/subsurface contamination downgradient of the East Landfill Pond are largely ignored The text mentions their existence but stops short of envisioning options If upgradient contamination from another source not characterized in any other investigation has crossed the OU7 boundary, it remains OU7's responsibility to manage any risk from that contamination

Response

Groundwater contamination upgradient of the landfill will be addressed in the Phase I RFI/RI for OU 10, Other Outside Closures The text of the OU 7 Work Plan Technical Memorandum will be modified to reflect this management strategy Subsurface

contamination in groundwater downgradient of the East Landfill Pond will be investigated during Phase II

2 0 Specific Comments

1 Comment

Table 2-6 lists the geometric mean for the hydraulic conductivity of "Disturbed Alluvium & Fill Material" (artificial fill) as 4 37 cm/sec This appears to be missing the corresponding power of ten notation

Response

Table 2-6 has been revised to reflect the correct geometric mean for the hydraulic conductivity values of "Disturbed Alluvium and Fill Material" (1 91 x 10^{5} cm/sec) and "Landfill Debris" (3 74 x 10^{5} cm/sec)

2 Comment

The following three comments relate to ELP surface soils and the larger issue of background

All but one of the 17 PCOCs for ELP surface soils failed the hot measurement test (Table 4-13) However, the results of all of the comparisons are not provided The Appendix M data disk only contains hot measurement test results for groundwater For example, because one data point for americium-241 is 26 6 times larger than the corresponding (Rock Creek) $UTL_{99/99}$ it would be informative to look at the plutonium-239/240 value at the same location This is not possible without the data

The $UTL_{99/99}$ values presented in Table 4-14 do not fully agree with the values from Table 3-9 of the *Background Soils Characterization Program Work Plan* (Metals Concentrations in Surface Soils from Rock Creek Study) Specifically, the values for calcium, magnesium, selenium, sodium, vanadium, and zinc in Table 4-14 are higher than those in the reference document This brings the validity of the remaining $UTL_{99/99}$ values that were not presented in Table 4-14 into question

Figures 4-17 through 4-27, depicting the extent of surface soil contamination, reference the *Background Geochemical Characterization Report for 1992* The correct version of this report is the final submittal dated September 1993, and to the Division's knowledge, does not contain surface soil data from 0 to 2 inches We were unable to verify the $UTL_{99/99}$ values presented on these Figures

This discussion needs to correctly and consistently identify the data sources AND provide ALL relevant data to allow confirmation of the conclusions

Response

Results of all statistical analyses will be included on a data disk in Appendix M Analytical data are included on a disk in Appendix N Background values for surface soils were calculated using data from the Rock Creek study area All $UTL_{99/99}$ values will be checked for accuracy, and statistical comparisons will be redone if necessary

3 **Comment**

Section 4 4 2, Bedrock Geologic Materials The Division is reticent to accept the argument that high strontium concentrations (or any other analyte failing the statistical tests) is due to differences in the types of geological materials instead of the presences of contamination This undermines the whole purpose of the background comparison In such a case the analyte should be carried through the remainder of the COC selection process

Response

The OU 7 Work Plan Technical Memorandum does not recommend elimination of strontium as a PCOC The technical memorandum merely states the fact that elevated concentrations of this analyte occur in borehole samples hydraulically upgradient and downgradient of OU 7 Because concentrations downgradient are similar to concentrations upgradient, it cannot be conclusively stated based solely on statistical comparisons that OU 7 represents a source of strontium that has migrated to downgradient borehole locations causing contamination Therefore, the technical memorandum simply presents an alternative explanation based on geochemical considerations

4 **Comment**

Section 4 7 2, VOC Distribution in Groundwater The "total VOC" approach presented may be helpful to describe the spatial extent of VOCs in groundwater but will have no bearing on remedial decisions for this media

Response

The nature and extent of contamination was evaluated using "total" VOC concentrations, however, it is agreed that this approach has no bearing on remedial decisions

5 **Comment**

Sections 4 7 3 and 4 7 4 The discussion of the nature and extent of contamination in UHSU/LHSU groundwaters is lacking any mention of metals

Response

The discussion of the nature and extent of contamination in UHSU/LHSU groundwater refers to tables showing metals identified as PCOCs, however, the metals are not specified in the text and no isoconcentration maps are included This section will be revised as appropriate to include the distribution of metals in groundwater

6 **Comment**

Table 4-2 Why is the volume of compacted trash for the years 1987-1991 almost triple the volume of all other years?

Response

The daily volume of compacted trash for the years 1987-1991 is estimated at 115 cubic yards (DOE 1991) This estimate will be verified for the final report

7 **Comment**

Section 5 4, DQOs for ELP Sediments and Adjacent Soils The text states that the information required to make a decision includes estimates of the risk to human health and the environment (i e a "focused" risk assessment), that sources for each item of information have been identified, and that sufficient data have been collected to make decisions about the need for remediation It goes on to say that the number of surface soil samples collected during the Phase I RFI/RI far exceed the minimum required to support the DQOs Nevertheless, additional samples are recommended

The Division does not understand why verification samples at locations exceeding the $UTL_{99/99}$ are necessary The Phase I data is validated and fully useable - why repeat the effort? Defining the spatial delineation of hotspots may be needed, but resampling the same locations for verification purposes seems needless

Are three samples sufficient to adequately characterize the sediment? Most statistical literature considers a sample size of eight to be a minimum

Response

Verification sampling at locations that exceed the $UTL_{99/99}$ were originally proposed because much of the area east of the landfill has been regraded and the hotspots may no longer exist Because the proposed landfill cap extends to the dam, surface soil samples for verification of hotspots are no longer necessary upgradient of the dam

It is agreed that most statistical literature considers a sample size of eight to be a minimum If State land disposal restrictions (LDRs) do not trigger further action at the East Landfill Pond, sediments will be covered by the landfill cap and no further sampling is required However, if State LDRs do trigger further action, additional samples will be collected for TCLP analyses

8 **Comment**

Section 5 5, DQOs for Groundwater and Surface Water The decision to remediate organics cannot be based on the analysis presented in Section 4 7 The "total VOC" discussion qualitatively describes nature and extent, however, there are no ARARs for total VOCs, and as such, has no basis in remedial decisions

Response

Section 4-7 presents a list of PCOCs identified in UHSU and LHSU groundwater, the mean concentration, and the concentration range These analyte concentrations can be used for ARARs comparisons Isoconcentration maps can be used in concert with potentiometric surface maps to design the groundwater control/collection system The "total VOC" discussion supports the presentation of nature and extent of contamination only and has no bearing on remedial design

9 **Comment**

Section 5 6, DQOs for the Landfill Conflicting statements exist regarding the disposition of leachate Section 5 6 2 says leachate collection is not required if concentrations do not exceed chemical-specific ARARs, Section 5 6 5 says containment, control, and treatment of leachate is a component of the presumptive remedy The text needs to be changed to reflect a consistent strategy The Division endorses the latter approach

Response

The text in Section 5 6 2 will be revised as requested

10 Comment

Section 6 2, Surface Soils As previously noted, the Division does not support the need for confirmatory sampling Omitting this duplicative step would significantly reduce costs associated with Phase II fieldwork Delineating the area of soil contamination, to the extent the Phase I data has gaps, is acceptable

Response

Verification sampling will be omitted as requested

11 Comment

Section 6 3, Groundwater The Division questions objective (1) for the additional monitoring wells Section 2 presents a strong argument that the groundwater collection and diversion systems on the north side of the landfill have failed Add to this fact that landfilled waste has extended beyond the intercept system, implying any new system would need to be outside the edge of waste, makes determining the adequacy of the existing system unimportant The location of these proposed wells is also missing from Figure 6-3

The two proposed wells north and south of the ELP are very close (perhaps 250 feet) to existing wells 7187 and B206689, respectively, and are to be screened in the same intervals as the existing wells Will these proposed locations really tell us anything the existing wells cannot?

Response

The two monitoring wells proposed to evaluate the effectiveness of the groundwater intercept system were included in the sampling and analysis plan in error, the groundwater intercept system will be replaced so there is no need for additional evaluation Figure 6-3 is correct as shown

The two proposed wells north and south of the East Landfill Pond are located midway between the groundwater plume at the landfill and the compliance wells downgradient of the pond embankment Their purpose is to determine if the groundwater plume extends to the compliance boundary This information will support design of the groundwater collection system

12 Comment

Section 6 4, Landfill Cap Design What is the purpose of collecting 27 samples of the existing soil cover? This will all be under the cap Load bearing capability of this foundation layer is needed but can be determined with fewer samples

Response

It was originally proposed that 27 samples of the existing soil cover material be collected for load-bearing estimates Since the FSP was completed, engineers designing the landfill cap indicated that a determination of the load-bearing capability of the existing soil cover material is not necessary for the landfill cover design The field sampling plan will be revised accordingly

EPA's Comments on the OU7 Technical Memorandum

1 0 General Comments

1 **Comment**

The text states that the purpose of the proposed modified field sampling plan (FSP) is to gather information to support a risk assessment The risk assessment is a useful tool to evaluate the site risks to determine whether or not an action is warranted for the site In the case of OU7, the Present Landfill, it has already been decided that an action needs to take place pursuant to closure requirements under RCRA The current closure approach for OU7 consists of a landfill cover based on the presumptive remedy Therefore, a risk assessment is not required to justify the closure action However, a risk assessment will be required to evaluate post-closure site risks

Response

The purpose of the Phase II field sampling plan is to address data gaps identified during the data quality objectives process

On the basis of presumptive remediation, the scope of the risk assessment for OU 7 will be streamlined The containment remedy addresses all pathways associated with the source The threat of direct contact and surface water runoff is addressed by capping Exposure to contaminated groundwater, the ingestion pathway, is addressed by groundwater treatment/control Exposure to landfill gas, the inhalation pathway, is addressed by gas collection and treatment

No quantitative risk assessment is required at the source Justification for remedial action is the exceedance of chemical-specific ARARs in groundwater Because the landfill cap extends to the dam, no risk assessment on pond sediments and surrounding soils is required

Analyte concentrations in surface soils not under the cap will be compared to PRGs after landfill closure An assessment of risk is required for groundwater contaminated by migrating leachate to determine the need for additional remedial action in areas beyond the cap Residual risks will be evaluated after closure of the landfill

2 **Comment**

There are several inconsistencies throughout the text regarding the East Landfill Pond sediments The text states in the executive summary that the sediments should be sampled in order to determine whether the sediments should be remediated or not Later,

In Section 5, page 5-11, it is stated that five out of the 12 potential contaminants of concern (PCOCs) for the sediments, based on previous sampling efforts, exceeded the TBC or PRG by at least one order of magnitude The text further states that it is unlikely that additional data will affect the decision to remediate the pond sediments The proposed FSP in this TM intends to take three additional samples from the pond sediments Because the available data already support a decision to remediate the pond sediments, the need for further sampling solely for characterization purposes is questionable EPA feels that further sampling of the pond sediments may be warranted to support the selection of a remedial technology or remedial strategies For example, sediment sampling could be useful for the following purposes to determine the total volume of sediments to be remediated, to perform contaminant leachability tests (TCLP), and to perform treatability studies EPA suggests that proposed pond sediment sampling activities be revised in order to redefine the scope of the effort and its purpose

Response

Preliminary engineering design of the landfill cover indicates that the cap will extend to the pond embankment If State LDRs do not trigger further action at the pond, the sediments will be covered by the cap and no additional sediment sampling will be required However, if the State LDRs do trigger further action, additional samples will be collected for TCLP analyses Inconsistencies or discrepancies in the text will be corrected

3 **Comment**

The Phase I RI report included in this TM failed to adequately evaluate the effectiveness of some physical structures such as slurry walls and interceptor trench systems installed around the OU7 area Specific comments regarding the effectiveness of these physical structures are detailed in the specific comments below and in PRC comments

Response

The "Effectiveness of Landfill Structures" (Section 2 5 4) evaluation addressed all known information relevant to the subsurface drainage structures The historical and acquired Phase I hyrogeological data along with the information derived from the 1991 ground-penetrating radar investigation provided multiple explanations as to the effectiveness of the landfill structures Given the evidence that refuse extends beyond the subsurface landfill structures, new landfill structures will have to be constructed under the presumptive remedy approach Therefore, based on the streamlined approach for remediation and closure of the landfill, the effectiveness of the landfill structure has for all practical purposes been adequately characterized The existing landfill structures will be abandoned in place and replaced under the landfill closure IM/IRA

4 Comment

The Phase I RI report also failed to evaluate the fate and transport of contaminants within the unsaturated zone This is critical information for closing hazardous waste in place Ground water impacts from sources of contamination left in place need to be fully evaluated and understood In this manner the appropriate cover design and post-closure care monitoring plan can be properly developed This TM needs to include a detailed discussion on the behavior of the contaminants present in OU7

Response

Under the NCP, characterization of landfill material is not required All source material in the vadose zone within the landfill is trash Source containment is the presumptive remedy for municipal landfills and consists of the following elements landfill cap, institutional controls, gas collection and treatment, leachate collection and treatment, and source area groundwater control The existing groundwater intercept system and slurry walls will be replaced under the landfill closure IM/IRA for source area groundwater control The landfill cap and the new groundwater intercept system will prevent infiltration of water and formation of leachate in the future Fate and transport of contaminants within the unsaturated zone is not appropriate under presumptive remediation

5 Comment

Due to major flaws with the Phase I RI report EPA is unable to determine whether there are any field data gaps within the OU7 area If it turns out that field data gaps exist after the TM is revised, then EPA will require additional field sampling activities to be performed

Response

Based on DOE's review of the technical memorandum, there are no data gaps However, if EPA determines that there are field data gaps, additional sampling activities must be proposed before the technical memorandum is approved

2 0 Specific Comments

1 Comment

Section 2 5 4 1, Transect AA-AA' This section discusses transect BB-BB' instead of AA-AA' This needs to be revised to refer to the appropriate location being discussed

Response

This section does not discuss transect BB-BB' Figure 2-31 "Well Hydrograph Transect Location Map" show that wells 70093, 71193, 71493, 71693, and 71893 lie along Transect AA-AA' The text in Section 2 5 4 1 correctly refers to these wells (p 2-29), therefore it is unnecessary to refer to Transect BB-BB'

2 **Comment**

Section 2 5 4 1, Transect BB-BB' North Side Change to "Transect CC-CC' "

Response

Figure 2-31 shows that wells 6087, 6187,6287, 6387, and 73293 lie along Transect BB-BB' The text in Section 2 5 4 1 correctly refers to these wells (p 2-29) Therefore, this section does not need to refer to Transect CC-CC'

3 **Comment**

Section 2 5 4 1, Transect CC-CC' South Side The conclusion in this section that the interceptor trench system is effective in this location because of differences between the saturated thickness of both alluvial wells is not well supported Differences in saturated thickness could be due to a slope area or any other lithology differences It is not appropriate to rely only on the saturated thickness of the wells to evaluate the effectiveness of the interceptor trench system In addition, looking at Table 2-7, the water-level elevation between the two wells is about the same (0 03 ft difference) This may be a good indication that the interceptor trench system is not effective This section needs to be revised to provide better justification of the conclusion or the conclusion should be changed

Response

The saturated thickness of the surficial materials was not the only criteria used to evaluate the effectiveness of the south groundwater intercept system The well hydrographs, potentiometric maps, and groundwater quality comparisons were all used during this evaluation The following summarizes the findings of each evaluation

1 Figure 2-29 shows a saturated thickness difference of 4 93 feet between wells 6587 and 6487 (p 2-30)

2 As stated in the text (p 2-30), the well hydrograph presented in Figure 2-34 shows that water levels outside or upgradient of the intercept system are higher than water levels within the system

3 In contradiction to what was stated in the referenced comment, the potentiometric maps of surficial materials (Figures 2-21 through 2-24) and Table 2-7 show that the mean water level difference between wells 6487 and 6587 is 3 27 feet, not 0 03 feet

4 In Section 2 5 4 2, Groundwater Quality Comparison" (p 2-33 and 2-34) it is discussed that the TDS concentrations in well 6487 are significantly greater than in 6587 (Figure 2-31)

These evaluations strongly suggest that the south groundwater intercept system along Transect CC-CC' is effectively diverting groundwater away from the landfill

4 Comment

Section 2 5 4 1, Transect DD-DD', Evaluation of the North Slurry Wall This section states that based on the well hydrograph and isopach maps of well 6787 and 6887, groundwater appears to be flowing over and/or through the slurry wall Instead of concluding that the slurry wall is not effective at this location, the text argues that it is possible that the well pair was not properly positioned on either side of the slurry wall or that the slurry wall does not extend this far to the east EPA feels that the relative location of wells from the slurry wall should be known If the location of the slurry wall is unknown, then efforts to locate it using geophysical techniques should be performed This section needs to be revised to provide better justification of the conclusion or the conclusion should be changed

Response

As was discussed in Section 1 4 4 (p 1-16), the ground-penetrating radar investigation conducted during 1991 suggests that the north slurry wall is located farther west than previously thought In addition, the potentiometric maps and saturated thickness maps do not suggest a zone of recharge caused by a breach in the north slurry wall in this area of the landfill Therefore, given this supporting evidence, it is inconclusive as to whether the north slurry wall is failing as far east as well pair 6787/6887 The entire groundwater intercept system and slurry walls will be replaced under the landfill closure IM/IRA

5 **Comment**

Transect EE-EE' Evaluation of the South Slurry Wall Change to "Transect DD-DD' "

Response

Figure 2-31 shows that wells 72293, B206389, 7287, and B206489 lie along Transect EE-EE' The text in Section 2 5 4 1 (p 2-31) correctly refers to these wells, therefore it is unnecessary to refer to Transect DD-DD'

6 **Comment**

Section 6 2, Surface Soils, page 6-2 The FSP proposes collecting 39 additional surficial soil samples at 34 hotspot locations identified from previous sampling efforts for confirmation purposes EPA feels that in order to confirm adequacy of previous data, fewer surficial samples will be sufficient EPA recommends that five samples be collected for confirmation purposes If it is determined that surficial soil data gaps exist within the OU7 or East Landfill Pond area, additional surficial soil samples may need to be taken

Response

Verification sampling at locations that exceeded the $UTL_{99/99}$ were originally proposed because much of the area east of the landfill has been regraded and the hotspots may no longer exist Because the proposed landfill cap extends to the dam, surface soil samples for verification of hotspots are no longer necessary upgradient of the dam

7 **Comment**

Section 6 2 1, Proposed Field Sampling Activities The text states that subsurface soil samples will be collected using the hand auger method outlined in Geotechnical SOP 08, Surface Soil Sampling (EG&G 1992c) This is inconsistent with Section 6 3 1 which suggests the use of a hollow-stem auger equipped for continuous core sampling in accordance with Geotechnical SOP 02 It appears that the wrong SOP is referenced in this case The hand auger method is not appropriate for collection of subsurface soil samples This section needs to be revised accordingly to include the appropriate drilling technique and respective SOP

In addition, it is not clear whether subsurface soil samples will be collected for characterization purposes EPA feels that it will be worthwhile to take advantage at each well location to collect subsurface soils during the drilling In this manner, further delineation of the extent of contamination of the unsaturated soils can be assessed EPA suggests that the FSP be revised to include subsurface soils collection and

characterization The appropriate analytical suite for subsurface soil sample analysis needs to be developed and included in this TM

Response

The text in Section 6 3 1 is referring to surface soil samples from the 0-to 10-inch horizon In order to be consistent with the Phase I program, surface soil samples from the 0- to 10-inch horizon will be collected using the hand auger method The SOP reference is correct as stated

Concentrations of a few analytes exceeded the $UTL_{99/99}$ value in subsurface geologic materials, however, the exceedances did not occur consistently in the same samples or in samples from the same depth interval For these reasons, no additional subsurface soil samples are proposed

8 **Comment**

Section 6 3, Groundwater EPA feels that the proposed eight well locations are adequate as a starting point to evaluate the three objectives outlined in the last paragraph of this page EPA is concerned that the results of this sampling effort may suggest that additional sampling is required to fully evaluate the three objectives If this turns out to be the case, then EPA will require additional sampling to be done This section should include this possibility

Response

Wells 4087 and 4287 are currently being sampled monthly or bimonthly to better delineate the nature and extent of contamination downgradient in No Name Gulch before the Phase II wells are installed In addition, two new wells have been installed under the WARP program, and three new piezometers have been installed upgradient of the confluence with North Walnut Creek They will be sampled during fourth quarter 1994 This information will be used to determine data gaps, optimize the locations of the Phase II wells, and hopefully alleviate the need for a Phase III RFI/RI

9 **Comment**

Section 6 4, Field Activities Related to Landfill Cap Design EPA agrees that information on the physical properties of the soils and gas emission rates are useful for the selection of the landfill cap design However, EPA feels that the evaluation of the appropriate landfill cap design for OU7 may require additional information on the fate and transport of contaminants within the unsaturated zone For example, contaminant leachability test columns, leachability transport models and TCLP analysis will provide crucial information

to evaluate and select the appropriate cap design EPA suggests that the scope of this section be expanded to include the above field activities It is important to understand the behavior of contaminants present at OU7 and their migration potential to ground water One of the main objectives of the closure of OU7 is to stop sources impacting ground water quality

Response

Contaminant leachability tests, leachability transport models, and TCLP analyses do not provide data necessary for landfill cap design Under the NCP, characterization of landfill material is not required All source material in the vadose zone within the landfill is trash In addition, the cap and new groundwater intercept system will prevent infiltration of water and formation of leachate in the future The existing groundwater intercept system will be abandoned in place and replaced under the landfill closure IM/IRA

PRC Comments on the OU7 Technical Memorandum

1 0 Introduction

At the request of the U S Environmental Protection Agency (EPA) PRC Environmental Management, Inc (PRC) has conducted a technical review of the Draft Final Revised Work Plan for Operable Unit 7 (OU7) at the U S Department of Energy (DOE) Rocky Flats Plant (OU7 Revised Work Plan) OU7 consists of the Present Landfill and the Inactive Hazardous Waste Storage Area which have been designated Individual Hazardous Substance Sites (IHSSs) 114 and 203 The OU7 Revised Work Plan was submitted to EPA by EG&G on behalf of DOE on May 30, 1994

The comments generated from this review are divided into general and specific comments General comments pertain to the document as a whole or to multiple sections of the document Specific comments are keyed to a particular page, paragraph, table, or figure Where FRC found similar problems in several sections of the report, a general comment was written to avoid redundancy General and specific comments appear in Sections 2 0 and 3 0 of this review Conclusions appear in Section 4 0 of this report References are contained in Section 5 0 Typographical and editorial errors within the OU7 Revised Work Plan have not been addressed, except when the clarity of the document was affected

2 0 General Comments

Section 2 0 - Site Characterization

1 Comment

A large portion of the characterization focuses on an evaluation of the structures designed to divert groundwater away from the landfill (slurry walls, groundwater diversion/leachate collection system) Well pairs that supposedly straddle these structures are used to compare hydrologic and chemical conditions on either side of the structures in an attempt to determine whether the structures function as intended However, the text indicates that the location of these structures is not always known relative to the well pairs, rendering the analysis inconclusive

A specific example is the analysis of total dissolved solids (TDS) data in Section 2 5 4 2 Groundwater TDS results from paired wells that supposedly straddle the groundwater diversion system or slurry walls were statistically analyzed The null hypothesis is stated as a TDS concentration in groundwater outside the interceptor system are statistically different than TDS concentrations in groundwater inside the interceptor system The results of this statistical comparison, however, are used to draw conclusions other than to

accept or reject the null hypothesis For instance, the analysis determined that TDS concentrations at well 71493, which is supposed to be located inside the interceptor system, are similar to TDS concentrations at wells 70093 and 71193, which are located outside the interceptor system Instead of rejecting the null hypothesis that TDS concentrations are different on either side of the interceptor systems and concluding that the interceptor system is not effectively diverting groundwater at this location, the OU7 Revised Work Plan suggests that the results indicate that all three wells are located outside of the interceptor system Figure 2-40 shows that this part of the interceptor system is an inflow boundary (because it is not believed to be keyed into bedrock in this area), which would suggest groundwater inside the landfill at well 71493 is thoroughly mixed with groundwater from outside the landfill

This example highlights the major weakness of Section 2 0, that any analysis of the effectiveness of the groundwater intercept and diversion structures depends on first accurately locating the structures This could have been accomplished with various geophysical methods such as ground-penetrating radar The analyses of groundwater diversion structures effectiveness should not be considered conclusive in areas where there is any doubt of their locations Groundwater analytical results should not be used to determine the locations of these structures

Response

A ground-penetrating radar (GPR) survey was performed at the Present Landfill in 1991 (EG&G 1991a) to delineate the existing groundwater intercept system and slurry walls, locate pipe drain modifications and discharge valves, and provide qualitative information on the construction of the groundwater intercept system and slurry walls The landfill structures have been accurately located using GPR data and existing wells

The text in Section 2 0 will be revised to clarify the level of accuracy regarding the landfill structure locations Section 2 5 4 2, which discusses TDS data, will be revised to reject the null hypothesis

2 **Comment**

The groundwater flow velocities presented in Section 2 5 3 4 are questionable as a result of errors in quantifying input parameters, particularly in the area beneath and downgradient of the East Landfill Pond embankment Significant errors were made in the calculation of hydraulic gradient and the estimation of hydraulic conductivity, both of which are addressed in specific comments later in this report Indicative of the overall quality of this analysis is the assignment of a uniform range of effective porosity (0 1 to 0 2) for the entire range of subsurface materials at OU7, from unweathered claystone to landfill debris This section should be completely rewritten to provide estimated groundwater

flow velocities that are supported by data If additional data are needed to fully characterize the area beneath and downgradient of the East Landfill Pond embankment, collection of these data should be incorporated into the Phase II field activities

Response

Significant errors were not made in the calculation of lateral hydraulic gradients (dh/dx) Contradictory to specific comments 2 and 10, hydraulic heads from two different geologic units were not used to calculate lateral hydraulic gradients Refer to page 2-25, paragraph 3, for the methodology used to calculate lateral hydraulic gradients This section states that the well pairs were only used to calculate the flow path distance "dx" The change in head "dh" of the specified unit (i e , surficial deposits or weathered bedrock) were obtained from the appropriate potentiometric surface maps

The range of effective porosity values used to calculate groundwater flow velocities in the surficial and weathered bedrock flow systems are well within the range of values for similar materials that are reported in the literature McWhorter and Sunada (1977) report ranges of effective porosity/specific yield values for clay (0 01 - 0 18), siltstone (0 01 - 0 33), and coarse gravel (0 13 - 0 25) Hurr (1976) reports Rocky Flats site-specific effective porosity values for the Rocky Flats Alluvium (0 1) and the Arapahoe Formation (0 1 - 0 15) In addition, the range of effective porosity values for the weathered bedrock is supported by estimated porosity values reported on the borehole logs (Appendix E) Based on the given information, the effective porosity values used to calculate groundwater flow velocities appear to be reasonable estimates

Section 6 0 addresses additional characterization downgradient of the East Landfill Pond Embankment The Phase II investigation includes the acquisition of geologic, groundwater chemical, and hydrologic data

3 Comment

A brief review of Section 2 6 7 revealed two conceptual errors with water balance components Vertical hydraulic gradients presented in Table 2-10 to support Section 2 6 7 7 include a gradient calculated from well pair 72393/72093 It is inappropriate to include this well pair in the calculation of the mean vertical hydraulic gradient from the fill to the weathered bedrock because both wells are screened in the fill material This may account for their anomalously low hydraulic gradient The discussion of the calculation of groundwater base flow to the East Landfill Pond in Section 2 6 7 8 states, " because most of the East Landfill Pond bottom is underlain by unweathered bedrock, the cross-sectional area of flow is defined by the depth of groundwater at the pond shoreline" (the difference between pond surface elevation and landfill seep elevation) Geologic cross-section G-G' (Figure 2-15) depicts weathered bedrock having a thickness of 15 feet below

the pond, which is supported by logs of nearby bedrock wells 0886 and B206789 Therefore, the cross-sectional area should be the difference between seep elevation and the mean elevation of the pond bottom This statement and any related calculations should be corrected

The water balance itself is very difficult to understand The relationship of each of the components listed in the columns of Table 2-14 is not immediately apparent Two different water balance equations are stated, one on page 2-40 and one on page 2-47 Neither equation can be used to calculate the monthly pond storages listed in column P To reproduce those numbers, the equation listed on page 2-47 must be used, discharge from the groundwater interception system must be added, and seepage from the landfill pond must be subtracted, Equations used should be accurately and consistently referenced in the document to avoid confusion

Response

The vertical gradients obtained from well pair 72393/72093 will be excluded in the calculation of the mean vertical hydraulic gradient from the fill to the weathered bedrock Vertical seepage rates incorporated in the water balance will be revised accordingly

Using the proposed cross-sectional area (between the seep evaluation and mean elevation of the pond bottom) may overestimate the baseflow to the East Landfill Pond The conclusions in Section 2 6 8 state that (1) "surficial groundwater appears to be continuously recharging the East Landfill Pond" and (2) "downward seepage appears to be recharging the weathered bedrock beneath the East Landfill Pond " Therefore, using a mean saturated thickness of 5 feet may be a more accurate approximation of baseflow to the East Landfill Pond

The water balance (Section 2 6 7) will be revised to minimize confusion about the relationship between the inflow and outflow components The OU 7 watershed will be modeled as two separate systems (1) the Present Landfill Area and (2) the East Landfill Pond Drainage Area This will clarify inflow and outflow components and allow conceptualization of the hydrologic flow regime at OU 7

Section 3 0 - Data Quality and Useability

4 Comment

The OU7 Revised Work Plan calculated an average relative percent difference (RPD) for each analyte group (such as metals) in each matrix that was sampled, and used this average to assess whether the precision of data for each analyte group (by matrix) was acceptable The RPD is a measurement of the precision of data and is evaluated by

comparing analytical results for real samples with their associated duplicate samples The RPD for a matrix should be assessed on an individual analyte basis, not as an average for an analyte group As previously stated in the report acceptable RPDs are less than 20 percent for all analytes in water (surface and ground) and less than 35 percent for all analytes in soil (surficial, subsurface geologic material and sediments) RPDs for individual analytes greater than these values are listed throughout Section 3 1 5 and are not within an acceptable range Therefore, all real data that correspond to this quality control (QC) result should be treated accordingly The precision criteria formulated for the contract laboratory program (CLP) and non-CLP method analyses should be followed

Response

RPDs for individual sample pairs (Real + Duplicate) commonly exceed the acceptable limits for precision PRC recommends classification of all results for an analyte based on the RPDs for individual sample pairs as opposed to an average RPD for the analyte (calculated from numerous sample pairs) Following PRC's recommendation will result in classification of data from many analytes as estimated results These results do not meet the established criteria for precision and thus would not be fully usable in the human health risk assessment The data can be classified as requested by PRC but this approach will affect the types of data considered usable for the risk assessment

5 **Comment**

For example pairs where a detectable result is reported for one sample and a non-detect result qualifier is reported for another, the RPDs were calculated by substituting the detection limits for the nondetected results When evaluating a nondetected value, it is inappropriate to assume that value to be the detection limit The RPD is expressed as

$$RPD = \frac{(R - D)}{\left[\frac{(R + D)}{2}\right] \times 100}$$

R = the concentration of the analyte in the real sample

D = the concentration of the analyte in the duplicate sample

Therefore, if D is less than the detection limit, it is improper to assume that value to be the detection limit Standard practice for the calculation of an RPD where a compound is not detected is to assign one-half the detection limit as the concentration

Response

When one of the results from the duplicate pair (Real, Duplicate) is a non-detectable value then the concentration of the analyte in that sample is not known, and the precision of the analysis cannot be calculated Therefore, use of either the detection limit or one-half the detection limit, both estimated values, to calculate an RPD cannot describe the precision of the analysis

Elsewhere in this document, one-half the detection limit has been used as a replacement value for non-detects (i e , to calculate summary statistics) However, a "standard practice" for calculation of RPDs when one of the results used is a non-detect is debateable Therefore, PRC's request for this change seems arbitrary and unnecessary for performance of the data quality analysis A more detailed explanation of the RPDs calculated for duplicate pairs with one non-detect result will be added to the discussion of precision

Section 4 0 - Nature and Extent of Contamination

6 **Comment**

Overall, the statistical analysis procedures used for background comparisons as outlined in this section are consistent with those recommended by Dr Gilbert (Gilbert 1993) and required for selection of chemicals of concern (COCs) at Rocky Flats However, distinction between which inferential statistical tests were used to support the selection of the contaminant as a preliminary chemicals of concern (PCOC) should be provided in the text If the chemical passes only one inferential statistical test, it must be retained as a PCOC

Typically, PCOCs were selected in the risk assessment, not in a sampling and analysis plan The text should provide justification and rationale for carrying out the PCOC selection process independent of the risk assessment and prior to sampling

Due to the time constraints, statistical calculations could not be verified It was assumed that all statistics were calculated correctly

Response

Tables presenting which statistical tests were used to identify PCOCs are presented in Appendix M Any chemical identified as being elevated above background concentrations by any of the statistical tests was identified as a PCOC PCOC identification was based upon the statistical guidance presented in Gilbert (1993) and agreed upon by EPA, CDH, and DOE

Statistical comparisons of site-to-background data for OU 7 using the Gilbert (1993) methodology were performed primarily for the purpose of delineating the nature and extent of contamination and evaluating remedial alternatives Where appropriate, PCOCs identified using the Gilbert methodology may be used in the risk assessment

7 **Comment**

The work plan indicates that East Landfill Pond sediments will require remediation, because analytical results from sediment samples exceed five PCOCs by an order of magnitude or greater The accumulation of contaminants in the pond sediments suggests a lack of contaminant mobility within this environment Furthermore, the pond provides a system for the natural attenuation of organic contaminants contained in the landfill leachate Thus, the pond functions as a collection system for the leachate and as a primary treatment system for organic contaminants Because leachate collection may be an integral component of the presumptive remedy for CERCLA municipal landfill sites (EPA 1993), the East Landfill Pond should be replaced with a leachate control system if it is removed through remedial activities The OU7 revised work plan should discuss remediation of the East Landfill Pond in greater detail, and describe how a leachate control system will be integrated into the landfill closure process

Response

Preliminary engineering design of the landfill cover indicates that the cap will extend to the pond embankment If state LDRs do not trigger further action at the pond, the sediments will be covered by the cap The cap is the primary source containment component of the presumptive remedy and is being developed under the landfill closure IM/IRA A separate leachate collection IM/IRA will be constructed before landfill closure The various components of the presumptive remedy will be discussed in more detail as requested

8 **Comment**

The results of volatile organic compound (VOC) analyses conducted on samples collected from the southern section of the landfill indicate that elevated levels of chlorinated hydrocarbons are present in the upper hydrostratigraphic unit Although these compounds may originate at another operable unit, they may affect the landfill and the selection of landfill remedial strategies Therefore, the work plan should include the installation and sampling of additional wells to identify the extent of the chlorinated VOC contamination In addition, existing wells in this area may require sampling and analysis for VOCs to accurately delineate the extent of the chlorinated VOC contamination

Response

The extent of chlorinated VOC contamination downgradient of the plume shown south of the landfill is limited by data at wells 7087 and B206589 In addition, another well will be installed between the downgradient edge of the plume and the outfall of the southern groundwater intercept system These data will be used to further delineate the chlorinated hydrocarbon plume downgradient and south of the landfill

9 **Comment**

The use of averaged concentrations over a 3-year period to evaluate the nature and extent of landfill contaminants is inappropriate Averaging several years of data provides a false indication of the extent and type of contamination that is currently present at OU7 This approach may potentially obscure high and low concentrations, and does not provide accurate information on the locations and concentrations present in the environment Each year of data should be averaged and isoconcentration maps prepared from these results Presented in this fashion, the three sets of data may indicate trends in the transport and fate also the future extent of the contamination

Response

Three years of groundwater concentration data were averaged and plotted to analyze the nature and extent of groundwater contamination at OU 7 The averaging technique was used to minimize the influence of seasonality and natural variability in intra-well concentrations Isoconcentration maps for each year or quarter would provide limited information due to missing data and data variability and would not provide a broad interpretation of groundwater contamination at OU 7 Averaging the data over a three-year period provides a better picture of general groundwater quality then would be provided by any individual sampling period It is recognized that these average concentration maps may not provide the best interpretation of groundwater quality for some remedial activities In these cases, other interpretations or maps (such as those displaying minimum and maximum concentrations) may be more appropriate For the purpose of analyzing the general nature and extent of groundwater contamination at OU 7, however, the average concentration maps are a useful and effective tool It is unlikely that maps depicting average yearly concentrations will indicate trends in the fate and transport of contaminants due to the high intrinsic variability of groundwater concentration data at OU 7

Section 5 0 - Data Quality Objectives

10 Comment

Section 5 discusses the data quality objectives (DQOs) associated with the investigation of the landfill and identifies the number of samples required to delineate the nature and extent of contamination for each media, sediments, groundwater, and the landfill However, it is not clear from the text in Section 6 (Sampling and Analysis Plan) how this information was used to determine the recommended number of samples to be collected during the additional investigation The rationale used during the investigation of the DQO process and the sampling design must be clearly presented

Response

The rationale used during development of DQOs and the resultant sampling design will be clarified as suggested

Appendix J, Data Quality Tables

11 Comment

Data in Tables J-11 through J-13 are presented in a format that is not consistent with the discussion of data quality in the text or consistent with other tables in the appendix The text and the other tables present data organized primarily by analyte type (metals, radionuclides) Tables J-11 through J-13 group all analyte types together, and list all compounds in alphabetical order, with analytes that have numerical prefixes preceding all other analytes Tables J-11 through J-13 should be reformatted to match the text and other tables

Response

Tables J-11 through J-13 will be reformatted as requested

3 0 Specific Comments

1 Comment

Page 2-20, Paragraph 3 The text states, "groundwater in the upper hydrostratigraphic unit (UHSU) generally flows to the east, but is diverted around the landfill by way of the groundwater intercept system " However, Figure 2-40 shows that groundwater passes beneath the intercept system along the northwestern boundary of the landfill There is also some question as to whether the slurry walls effectively divert water away from the

landfill This statement should be revised to be consistent with the conclusions stated elsewhere in the text

Response

This statement will be revised as follows "Groundwater in the upper hydrostratigraphic unit generally flows to the east, but localized flow near the landfill is altered due to stresses induced by the groundwater intercept system "

2 Comment

Page 2-28, Paragraph 1 The text specifies an average horizontal groundwater gradient through the surficial materials at the East Landfill Pond embankment that is calculated from water levels at wells TH047492 and 4187 Well 4187 is screened across an unweathered sandstone at a depth of 81 to 94 feet and should be considered part of the lower hydrostratigraphic unit (LHSU), whereas well TH047492 is screened across artificial fill (embankment material) and subcropping, weathered sandstone This well should be considered to be screened in the UHSU Geological cross-section G-G (Figure 2-15) also depicts groundwater in well 4187 as having a different (about 70 feet lower) potentiometric surface then well TH047492 Therefore, well 4187 should not be used to calculate hydraulic gradients in surficial materials, or in the UHSU Wells TH047292 and TH047492, both of which are screened across artificial fill and subcropping, weathered bedrock, should used to calculate the UHSU hydraulic gradient instead

Response

Refer to Section 2 5 3 (page 2-25, paragraph 3) for a clarification on the methodology used to calculate lateral hydraulic gradients (refer to response to general comment 2)

3 Comment

Page 2-28, Paragraph 2 This paragraph provides average linear groundwater flow velocities in weathered bedrock along three flow paths, one of which is below the East Landfill Pond embankment, between wells TH047492 and 4187 The input parameters for this calculation include a geometric mean hydraulic conductivity value of $4\ 97 \times 10^{-7}$ centimeters per second (cm/sec) estimated using drawdown recovery test data from wells 70193 and 70493 Wells 70193 and 70493 are both screened in claystone and clayey siltstone, whereas well TH047492 is screened in sandstone Therefore, the hydraulic conductivity value derived from wells 70193 and 70493 is inappropriate to use for the area beneath the East Landfill Pond embankment, which is underlain, at least in part by sandstone The phase II field investigation should include a drawdown recovery test in

the weathered sandstone beneath or adjacent to the East Landfill Pond embankment, either in well TH047492 or in a new well that is screened in sandstone

Response

Agreed, a drawdown recovery test should be performed in the weathered bedrock adjacent to or downgradient of the East Landfill Pond embankment Additional characterization downgradient of the East Landfill Pond embankment is addressed in Section 6 0

4 Comment

Page 2-31, Paragraph 2 This paragraph discusses the effectiveness of the south slurry wall at diverting water away from the landfill Hydrograph EE-EE' (Figure 2-36) is cited as an indication that the slurry wall is diverting water from the landfill because water levels are 1 to 6 feet lower on the north (downgradient) side of the wall The paragraph also cites the potentiometric (Figures 2-21 through 2-24) and isopach (Figures 2-29 and 2-30) maps as supporting this interpretation because they show lower water levels north of the wall However, the isopach and potentiometric maps also show a large unsaturated area east of the wall, which is in a downgradient direction beyond the end of the wall Groundwater should be diverted to this area if the wall is functioning properly This paragraph should discuss the presence of this large unsaturated area, and the implications that this unsaturated area may have on the evaluation of the south slurry wall's effectiveness

Response

Based on the supporting evidence, it is unlikely that the presence of the large unsaturated area east of the south slurry wall would have any implications on the evaluation of the south slurry wall's effectiveness given the following evidence

1 The TDS concentration map (Figure 2-33) also indicates that the slurry wall is directing groundwater away from the landfill because TDS concentrations are significantly higher on the north (downgradient) side of the intercept system

2 Figures 2-29 and 2-30 show a saturated thickness of less than 5 feet on the south side of the slurry wall This suggests that the weathered bedrock topography may influence local groundwater flow The Weathered Bedrock Topography map (Figure 2-17) shows a NE trending ridge along the eastern margin of the slurry wall Because of the proximity of the weathered bedrock ridge to the unsaturated area, it is likely that this structural feature has an effect on localized groundwater flow, including groundwater flow being diverted away from the south slurry wall

The potentiometric maps of surficial materials (Figures 2-21 through 2-25) reveal a groundwater divide west of the large unsaturated area, giving support to the previous statement

5 **Comment**

Page 2-50, Paragraph 3 The text states that western wheatgrass is both the dominant graminoid in the mesic mixed grassland community of OU7, yet also describes it as a species present in lesser amounts than a dominant species The text should be clarified to indicate the correct category for western wheatgrass

Response

Western wheatgrass is a dominant grass in the mesic mixed grassland The text on page 2-50, paragraph 3, will be revised as requested to clarify this

6 **Comment**

Page 2-51, Paragraph 3 The text that the disturbed community included 27 species, of which seven were grasses, 18 were forbs, and two were subshrubs The text then states that the only shrub present was wild tarragon Fringed sage is included with forbs It is not clear what species were considered to be subshrubs or what criteria were used to distinguish shrubs and subshrubs The text should be clarified to describe the criteria used to distinguish the components of the disturbed community, and to identify the species included in each

Response

This paragraph will be clarified as requested

7 **Comment**

Pages 2-52 and 2-53 The text discusses wildlife surveys undertaken at Rocky Flats but cites only the environmental impact statement (EIS) produced in 1980 It is not clear whether the majority of the text is based on the EIS or on more recent studies Because more recent data exist, a 14-year old EIS report based on older data should not be used as the primary source or information on the site The most recent data should be used

Response

The results of a more recent wildlife study were mentioned in the text but not cited Page 2-52, paragraph 4, will be changed to clarify this

8 **Comment**

Figure 2-40 The analysis of groundwater levels at well pair 6787/6887 (pages 2-30 and 2-31) concludes that "groundwater appears to be flowing over and/or through the slurry wall" Figure 2-40, which depicts groundwater inflow and outflow boundaries of the landfill, should be revised to reflect this conclusion Water balance calculations in Section 2 6 7 should also be revised to reflect the longer inflow boundary

Response

This comment does not accurately address the concluding statements in the evaluation of the north slurry wall Refer to the first paragraph on page 2-31 The last sentence states "However, it is possible that the well pair was not positioned on either side of the slurry wall or that the slurry wall does not extend this far to the east" This assessment is supported by the GPR investigation which is discussed in Section 1 4 4 In addition, the potentiometric maps and saturated thickness maps do not suggest a zone of recharge caused by a breach in the slurry wall in this area of the landfill Therefore, given this supporting evidence it is inconclusive that the north groundwater diversion structures are failing as far east as well pair 6787/6887

9 **Comment**

Figure 2-42 The figure indicates that two locations in the pond were sampled for water and sediment toxicity studies The results of those studies were not provided in the discussion of ecological data provided in the text These results should be discussed

Response

Toxicity results are not appropriate for an ecological characterization To eliminate this confusion, the sampling location symbols will be removed from Figure 2-42

10. **Comment**

Table 2-9 This table summarizes lateral (horizontal) hydraulic gradients that were calculated for surficial materials and weathered bedrock The hydraulic gradient values are questionable for a number of reasons Horizontal hydraulic gradient is defined as a change in head from one well to another divided by the horizontal distance between the two wells Therefore, it is impossible that two different horizontal hydraulic gradients representing two different geologic units could be calculated between the same two well screens, as has been done for each pair of wells listed in the table Furthermore, hydraulic gradients in weathered bedrock are provided for each well pair even though five of the six wells are screened in surficial materials The only well screened in bedrock is

screened in the LHSU and should not be included in this analysis of UHSU hydraulic gradients Horizontal hydraulic gradients should be recalculated in a manner that makes sense hydrogeologically, and raw data (water level measurements and their data) should be included with the table Furthermore, this analysis would be less confusing if the wells were divided primarily by hydrostratigraphic unit rather than by geologic unit because some wells are screened across two geologic units

Response

The hydraulic gradients are not questionable and were calculated correctly Section 2 5 3 (page 2-25, paragraph 3) discusses the methodology used to calculate lateral hydraulic gradients (refer to general comment 2) However, it is recognized that Table 2-9 should be revised with a footnote that briefly describes the method used to calculate lateral hydraulic gradients

11 Comment

Figure 2-8 The groundwater intercept system is depicted in Figure 2-8 as consisting of perforated pipe along the entire length of the system This depiction contradicts all of the other figures, which show the perforated section extending only to, or slightly beyond, the western ends of the north and south slurry walls The figure should be corrected to accurately depict the perforated section of the groundwater intercept system

Response

The figure will be corrected as requested

12 Comment

Figure 2-13 Text and figures are not used consistent regarding the location of well B106089 relative to the groundwater intercept system Well B106089 is clearly depicted as being inside the groundwater intercept system on geologic cross-section E-E (Figure 2-13) and on all of the potentiometric and isopach maps However, hydrograph FF-FF (Figure 2-37) states that well B106089 is located outside the groundwater intercept system The text on page 2-29 (which discusses hydrograph FF-FF) and page 2-34 (which discusses the evaluation of the leachate control system) also indicates that well B106089 is outside the groundwater intercept system Figures and text should be revised to be consistent If the location of well B1060898 relative to the groundwater intercept system is not known with certainty, it should be clearly stated in the text

Response

According to Figure 2-7 in the OU 7 Phase I RFI/RI Work Plan, well B106089 is within the western extent of the sloping clay barrier wall and on the upgradient side of the perforated drain Therefore the geologic cross section presented in Figure 2-37 will be corrected to reflect the position of well B106089

13 **Comment**

Figures 2-29 and 2-30 The two isopachs (saturated thickness of surficial materials) maps are poorly drawn and may lead to errors in calculation of landfill leachate volume The most prominent feature on these maps is a groundwater mound that is greater than 20 feet thick at wells 72093 and 72393 in the center of the landfill This mound extends from the area northwest of the landfill, where the groundwater intercept system is not keyed into bedrock and terminates abruptly beyond this well pair The only data points in the downgradient direction within the landfill are well pair 72293/72493, where the saturated thickness is about 2 5 feet The bedrock topography map (Figure 2-17) shows that this well pair is situated on a bedrock ridge (interfluve) and that a channel incised into the bedrock surface probably lead from well pair 72093/72393 to cone petrometer test (CPT) point 01493 to a location at or slightly north of CPT point 02293 and then below the East Landfill Pond This channel passes north of well pair 72293/72493, which may be the reason that the saturated thickness is only 2 5 feet at this location Given the bedrock surface depicted in Figure 2-17, the most logical interpretation would be that groundwater below well pair 72093/72393 will follow the incised channel surface down to East Landfill Pond, forming a complete groundwater/leachate pathway to the pond This interpretation would be consistent with the statement on page 2-20 of the text " in the incised stream valley, groundwater flows toward the drainage or the East Landfill Pond, following the topography " Figures 2-29 and 2-30 should be revised to be consistent with this interpretation Calculations of landfill volume should also be revised to be consistent with this interpretation

Response

The saturated thickness maps will be revised to coincide with the weathered bedrock topography The landfill leachate volumes will also be revised accordingly

14 **Comment**

Section 3 1 6 This section discusses the accuracy of the OU7 data Accuracy measures the bias in a measurement system Bias is defined as

%B = 100 - %R

%R = the percent recovery of a spike of a known analyte

Accuracy was measured only for the dissolved and total metals of groundwater samples All matrices and analytes should be assessed for accuracy to fulfill the DQOs

Response

In accordance with EPA guidance and Rocky Flats quality assurance procedures, Section 3 1 6 defines accuracy as the %Bias calculated from analyses of matrix spikes However, the OU 7 QAA and Rocky Flats Standard Operating Procedures require collection of matrix spike samples only during collection of groundwater samples Therefore, no matrix spike samples were collected for other media/matrices and the results of their analyses cannot be discussed here as requested The text will be modified to explain that only a groundwater matrix-spike sample was collected during the OU 7 investigation

15 Comment

Table 3-2 Table 3-2 summarizes the actual QC samples collected at OU7 There are discrepancies between the required frequency of QC samples (Table 3-1) and the actual QC samples collected For example, of the 48 real soil gas samples collected at IHSS 203, only two field duplicate samples were collected The required frequency of field duplicates as stated in Table 3-1 is one duplicate per 10 real samples or one duplicate per sampling event (whichever is more frequent) Therefore, the required QC sample criterion was not met

Response

The text will state that the QC sample requirements were not met during the soil-gas sampling task However, this deficiency will not affect the usability of the soil-gas data, because these data are already classified as screening-level data

16 Comment

Section 3 1 2 2, Page 3-4, Third Paragraph and Table 3-5 This section discusses the results of the data validation These results are presented in Table 3-5 Discrepancies exist between the table and the discussion on page 3-4 For example, the percent results rejected (%R) of subsurface geologic material analyzed for radionuclides was calculated as 8%R This value is really 10%R Also, this section states that 72 percent of groundwater data were validated This value was recalculated to be 55 percent The values in this section should be calculated for accurate results, and the text and tables corrected to be consistent

Response

Corrections to Table 3-5 will be made and text on page 3-4 will be updated as requested

17 Comment

Section 3 1 5 4, Pages 3-12, Third Paragraph The RPDs were not calculated for VOCs in subsurface geologic material duplicate sample pairs When assessing the data quality and usability, it is important to evaluate the precision of the data Without the RPD, an overall measurement of precision is impossible RPDs should be calculated and reported for analyses on all matrices

Response

Discussion of RPD results for VOCs will be added to this section as requested

18 Comment

Section 3 1 7 1, Page 3-23, Third Paragraph This section concludes that based on the frequency of detection and concentrations detected in equipment rinsates, the data are well represented However, Table J-9 presented analytes (for example, trichloreothylene [TCE]) that were detected in every equipment rinsate Therefore, the statement that the data are well represented based on the frequency of detection is unfounded This should be corrected to state that the frequency of detection and concentration of analyses in equipment rinsates may have affected the representativeness of soil gas samples

Response

Agreed, the text should be corrected to accurately reflect the results of equipment rinsate samples

19 Comment

Section 3 1 7 3, Page 3-23, Fifth Paragraph This section states that the metals detected in the equipment rinsates were "most likely" present in the distilled water (source water) used to rinse the equipment The source water used for equipment rinsates should be analyzed and reported so that data support this statement

Response

No data are available to describe the distilled water used to prepare blanks The text will be modified to clarify this point, and a suggestion to obtain analyses of the distilled water will be added

20 **Comment**

Sections 3 1 7 3 through 3 1 7 7 These sections discuss the representativeness of the data Representativeness is analyzed with results from the equipment rinsates Inaccurate equipment rinsate data are presented For example, Section 3 1 7 4 states that 10 equipment rinsates were collected However, corresponding Table J-12 shows that many analytes are not represented 10 times All statements presented in the text should be supported by correct data in the tables

Response

The text will be clarified to address this comment

21 **Comment**

Section 3 1 8, Page 3-30, Third Paragraph The second sentence states that analytical data for soil gas did not meet the target 90 percent completeness goal The third sentence claims that the soil gas analytical data exceeded the 100 percent completeness goal These are conflicting statements The percent completeness for soil gas needs to be reassessed and consistently reported

Response

Soil-gas samples collected at IHSS 114 using the BAT/CPT system did not meet the target completeness goal Soil-gas samples collected at IHSS 203 using the hydropunch system did meet the target completeness goal The text describing the percent completeness for soil gas will be clarified

22 **Comment**

Section 3 1 8, Page 3-31, Second Paragraph Section 3 1 8 discusses completeness, which is represented in Table 3-5 As previously stated in specific comment number 16, discrepancies exist throughout Table 3-5 Therefore, Section 3 1 8 needs to be reassessed after Table 3-5 is reevaluated

Response

Corrections to Table 3-5 will be made, and the text in Section 3 1 8 will be revised as requested

23 Comment

Section 4 1, Page 4-1, Second Paragraph The text states that histograms and box-and-whisker plots for each analyte from each medium were generated for both site and background data Gilbert (1993) recommends that probability plots also be generated in order to determine the distribution of the data (that is, lognormal, normal, Weibull, or gamma) At a minimum, the text should describe how the distribution of the data was determined Knowing the distribution of the data helps to select the optimum statistical test

Response

Probability plots are not used to select the optimum statistical test within the Gilbert test methodology The test methodology is based on the concept of using a variety of statistical tests capable of detecting a wide range of possible contamination scenarios when used together Three of the tests (Gehan, Slippage, and Quantile) are nonparametric and therefore do not require any assumptions regarding data distribution The t-test is only used when data populations meet normality requirements (as determined by the Shapiro-Wilk test) Therefore, probability plots would not provide additional information required to perform these tests Since failure of any test makes a chemical a PCOC, the question of determining which test is optimal is irrelevant

24 Comment

Page 4-5, Second Paragraph The text states that the hot-measurement test will compare each measurement to a corresponding upper tolerance limit $(UTL)_{99/99}$ value The computed 99-percent UTL ($UTL_{99/99}$) is such that one is 99-percent confident the UTL is equal to or greater than the true 99th percentile of the population background measurements Gilbert (1993) recommends the use of $UTL_{95/95}$ value The results of using the $UTL_{99/99}$ is a large false negative error rate (that is, measurements from contaminated OUs would not be flagged) In other words, the use of $UTL_{99/99}$ increases the possibility of eliminating a chemical as a PCOC based on background comparison when it is actually above background This type of error should be minimized to the extent possible An explanation of why the $UTL_{99/99}$ rather than the $UTL_{95/95}$ was used and the potential outcome of using this criterion should be provided for the reader

Response

Gilbert (1993) does not recommend the use of the $UTL_{95/95}$ value On page 9, it explicitly states that while the $UTL_{95/95}$ is an acceptable candidate for the hot measurement value, it may result in a high probability of a site measurement exceeding the UTL value when the

site and background populations are identical The discussion goes on to state that one way to reduce the number of false positive flags is to use a UTL that has a higher confidence on a larger percentile The $UTL_{99/99}$ is given as an example EG&G guidance on implementing the Gilbert test methodology has adopted this approach

It should also be noted that the hot measurement test is not a formal statistical test because false positive and power requirements cannot be specified

25 Comment

Page 4-24, Second Paragraph The text states that the activity of americium-241 in one surface water sample from location SW098 exceeded the $UTL_{99/99}$ value According to Table 4-20 it appears that uranium-235 and americium-238 also exceed their corresponding $UTL_{99/99}$ values The text should be corrected to be consistent with the table

Response

Americium-241, uranium-235, and uranium-238 activities exceeded the $UTL_{99/99}$ in samples from SW098 The text will be corrected to be consistent with Table 4-20

26 Comment

Page 4-25, Second Paragraph The texts states that Table 4-20 lists six VOCs and one semivolatile organic compound (SVOC) as PCOCs Table 4-20 presents four VOCs and two SVOCs as PCOCs The text should be corrected to be consistent with the table

Response

Four VOCs and one SVOC were detected in samples from SW099 The text will be corrected to be consistent with Table 4-21

27 Comment

Page 4-27, Third and Fourth Paragraphs These sections state that total VOC concentrations were estimated by summing the concentrations of the most frequently detected VOCs at OU7 This procedure is not typically performed in risk assessments and is not consistent with current Risk Assessment Guidance for Superfund (RAGS) EPA 1989 The text should describe how this information will be used in the risk assessment

Response

This information was not intended for use in a risk assessment It is meant to be used to evaluate the nature and extent of contamination

28 **Comment**

Page 4-35, Fifth Paragraph The text states that methylene chloride and acetone were detected in laboratory blanks RAGS states that common laboratory contaminants may not be eliminated from the COC selection process unless they are less than 10 times the contaminants in the blank samples The text should provide this information and these chemicals should not be eliminated unless they are less than 10 times the concentration in the laboratory blank

Response

The PCOC selection process is based on the test methodology stated in Gilbert (1993) and EG&G guidance for implementing the methodology These chemicals were not eliminated as PCOCs based on the analysis described in the comment The PCOC selection process was used to describe the nature and extent of contamination at OU 7

29 **Comment**

Page 4-27, Paragraph 3 The use of "total" VOC concentrations to evaluate the nature and extent of VOC contamination is not appropriate The nature and extent should be evaluated for individual constituents or groups of similar compounds (such as chlorinated VOCs) The text should be modified to include this evaluation

Response

The nature and extent of contamination was evaluated using concentrations of chemical groups such as chlorinated hydrocarbons, BTEX, and SVOCs (See figures 4-31, 4-32, and 4-33) Individual VOC constituents were detected infrequently at any one location, and as a result, their spatial distribution could not be evaluated

30 **Comment**

Page 5-11 Paragraph 1 The text concludes that two sediment samples collected from the East Landfill Pond are sufficient to characterize the extent of contamination in East Landfill Pond sediment This conclusion is based on a calculation using an equation present in Section 5 4 7 However, the variance used in this calculation was determined from the analysis of three samples In general, analytical results from three samples is not considered sufficient to provide an accurate estimate of variance Therefore,

additional sampling of the East Landfill Pond sediments are necessary to determine the nature and extent of contamination in pond sediments The additional data would also be useful in assessing the fate and transport of contaminants entering the pond and in determining the remediation potential of the system (see general comment 7)

Response

It is agreed that analytical results from three samples are generally not considered sufficient to provide an accurate estimate of variance However, if state LDRs do not trigger further action at the East Landfill Pond, the sediments will be covered by the landfill cap and no further sampling is required If state LDRs do trigger further action, additional samples will be collected for TCLP analyses

31 Comment

Section 5 6 3, Page 5-22, Item 1 The first item of this paragraph lists types of data needed for landfill cap design, but does not address future landfill settlement An effort should be made to predict future settlement of the landfill Differential settlement will occur across the site based on the overall thickness and age of the waste, moisture content, and type of water The design of the landfill cap or post-closure maintenance of the cap will be affected by the overall settlement Evolution of the settlement prior to design will provide a more realistic and functional cap design or post-closure maintenance program

Response

Although information on differential settlement is important for single-layer clay caps because the clay barrier is compromised with movement or desiccation, differential settlement is not as important for multiple-layer caps The use of synthetic materials in multiple-layer caps (e g , geogrid fabric) overcomes settlement problems In addition, most of the waste material at the Present Landfill is composed of construction debris (asphalt, concrete, wood, etc), and waste within the primary layer of the landfill is fairly old, therefore subsidence is not considered an issue

32 Comment

Section 5 6 3, Page 4-22, Item 2 The second item of this paragraph lists information needed for leachate control, but does not address migration of upgradient groundwater through or beneath the groundwater diversion system and into the landfill Further evaluation or discussion of the existing leachate control/groundwater diversion systems should be included to assess their impact on the volume and rate of leachate generated

Response

Existing landfill structures will be abandoned in place and replaced as one component of the presumptive remedy under the landfill closure IM/IRA The landfill cap and new groundwater control system will prevent infiltration of water and formation of leachate in the future

33 **Comment**

Section 5 6 5, Page 5-25, Decision Route 4 Landfill gas control is typically necessary to ensure cap integrity and meet potential air emission applicable and relevant or appropriate requirements (ARARs) If gas treatment is not necessary based on ARARs, gas control should still be considered to ensure cap integrity and potential gas migration problems The text should be modified to address potential gas migration problems

Response

Gas control or gas collection and treatment is one component of the presumptive remedy under the landfill closure IM/IRA The text will be revised to clarify this issue

34 **Comment**

Section 6 4, Page 6-14 This section presents the methodology for collecting samples to determine the physical properties of this interim soil cover It is assumed that this determination will be used to evaluate the appropriateness of the interim soil cover as a final cover or as a structural base for the final cover The text should be modified to clearly support this assumption

The procedures state that the samples will be collected from the upper 2 inches of the cover This appears to be inadequate to evaluate the properties of the interim cover Samples that represent the entire profile of the interim soil cover would be more appropriate The stability or structural quality of the soil will also be based on the stability of the refuse The decomposition or consolidation potential of the refuse should also be determined to evaluate final cover options (see specific comment number 31)

Additionally, physical properties of the soil are being evaluated Therefore, procedures related to collection of samples for chemical analysis (such as equipment rinse blanks and decontamination) are not necessary and should be deleted from the discussion

Response

A determination of the load-bearing capability of the existing soil cover material is not necessary for the landfill cover design The field sampling plan will be revised accordingly

35 Comment

Page 6-4, Paragraph 4 This paragraph proposes eight additional monitoring wells to meet three objectives, one of which is to evaluate the effectiveness of the groundwater intercept system However, no action is proposed to close the gap in data for the north slurry wall The slurry wall should be accurately located relative to the well pair 6787/6887 If it is determined that the well pair straddles the slurry wall, it should be concluded that the slurry wall is ineffective and that the groundwater recharges the landfill along this boundary Water balance calculations, leachate volume calculations, and inputs to the Hydrologic Evaluation of Landfill Performance (HELP) model should be revised accordingly If it is determined that the well pair does not straddle the slurry wall, a monitoring well should be installed on the opposite side of the wall from the well pair at this location

Response

The text in this section is incorrect, it was not revised from the draft version Six additional monitoring wells are proposed to (1) delineate contaminant plumes in UHSU groundwater and (2) determine the presence or absence of groundwater contamination in the LHSU As a result of the adoption of a presumptive remedy strategy for OU 7, the groundwater intercept system and slurry walls will be replaced under the leachate control element of the presumptive remedy Therefore, there is no need to evaluate the effectiveness of the groundwater intercept system or the slurry walls

36 Comment

Page 6-12, Paragraph 1 The discussion on drawdown recovery testing states that the test will be started immediately after the last bailer of water is removed from the well The text should be more accurate if it is started the instant the bailer is lifted above the water level in the well

Response

The discussion of drawdown recovery testing follows Rocky Flats Standard Operating Procedures In addition, the initial response measures the properties of the filter pack not the properties of the surrounding formation (see Section 2 5 2 1, page 2-21)

37 **Comment**

Figure 6-3 The well pair that is to be drilled astride the north groundwater intercept system is not depicted on this figure showing proposed phase II monitoring well locations These wells should be added to the figure

Response

Figure 6-3 is correct as shown The text will be corrected to be consistent with the figure (see response to comment 35)

38 **Comment**

Section 7-1, Page 7-1, Second Paragraph This paragraph discusses the list of field QC samples collected at OU7 Matrix spike (MS) and matrix spike duplicates (MSD) are not included in this list MS/MSD samples are collected in the field at the time of sampling and are used to evaluate analytical precision and accuracy MS/MSD is a routine application and QC procedures for controlling the reliability and defensibly of data collected MS/MSDs should be included in the field QC program and discussed in this section

Response

Because there are only six proposed wells and they will be sampled only once for the Phase II field investigation, no MS/MSD samples will be collected during Phase II MS/MSD samples will be collected as part of the sitewide groundwater sampling program at these wells

39 **Comment**

Section 7-1, Page 7-1, Sixth Paragraph This paragraph states that trip blanks will accompany each shipment of water samples for VOC analysis Trip blanks are used to assess sources of contamination and cross contamination and their impact on data quality Trip blanks should accompany all materials that receive VOC analysis, including water samples The sampling program and the text should be modified to include trip blanks with all VOC samples collected

Response

The only samples proposed for collection under Phase II that will be analyzed for VOCs are groundwater samples

40 Comment

Section 7 2, Page 7-2, Second Paragraph This paragraph states that QC procedures for non-CLP methods will be developed as needed QC procedures should be addressed prior to sampling and analysis All analytical methods and QC procedures should be discussed in the revised work plan

Response

All analytical methods and QC procedures will be discussed as requested

41 Comment

Section 7 3 2, Page 7-3, Second Paragraph This section states the accuracy is expressed as a %R of a spike Accuracy is not only the assessment of the %R, but also evaluation of field and trip blanks Accuracy measures the bias of the sampling and analytical procedures and all appropriate QC samples should be evaluated and described in the revised work plan

Response

Equipment and trip blanks were evaluated and are described in Section 7 3 3, Representativeness These samples provide information to evaluate cross-contamination or contamination during transport of environmental samples but do not provide a measure of sampling or analytical bias A reference to the discussion of equipment and trip blanks will be added to Section 7 3 2 to clarify that all QC samples have been evaluated and described

4 0 Conclusion

The OU7 Revised Work Plan has three significant problems (1) the site hydrogeology is poorly characterized, (2) the analysis of data quality and useability is incomplete and deviates frequently from standard practices, and (3) it is not clear from the text how the presumptive remedy will be implemented and whether enough data will be collected to assure efficient operation and maintenance of the closed landfill

Most of the problems with this hydrogeologic characterization can be attributed to uncertainty in the location of landfill structure Broad assumptions regarding the effectiveness of the groundwater diversion/leachate control systems and slurry walls are incorporated into the water balance and the calculations of leachate volume, and ultimately will be incorporated into the modeling of leachate flow rate In addition, poor application of basic hydrogeologic principles is

evident in the calculation of hydraulic gradients The presentation of the water balance is unfocused and confusing and does not appear to be linked to a site conceptual model

The data quality analysis often deviates from established practices or is inconsistently applied to different analyte groups A more thorough data quality analysis should be performed, other sections of the report may then have to be revised, depending on the results of the analysis

The presumptive remedy is not presented in sufficient detail to ascertain whether significant issues in the operation and maintenance of the presumptive remedy, such as landfill settlement and gas control to ensure cap integrity, will be addressed Furthermore, it is never explicitly stated whether the existing landfill structures (groundwater collection/leachate control systems and slurry walls) are to be incorporated into the design and whether they will require any upgrading Finally, the remediation of the East Landfill Pond should be discussed in more detail, particularly regarding how leachate control will be handled if the pond is significantly altered during remediation

Response

1 The existing landfill structures will be replaced under the presumptive remedy Therefore, discussion about the effectiveness of the structures is irrelevant Basic hydrogeologic principles were used to calculate hydraulic gradients The methodology will be clarified in the text The water balance will be revised and linked to the site hydrologic model

2 Standard practices were followed in the analysis of data quality and usability Inconsistencies or discrepancies between text, tables, and conclusions drawn will be corrected

3 A detailed discussion of the presumptive remedy will be presented as requested

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